GEORGIA INSTITUTE OF TECHNOLOGY — OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[X] ORIGINAL [ ] REVISION NO. _____

Project No. G-35-653 (R6024-0A0) GTRC/~~GIT~~ DATE 9 / 12 / 85

Project Director: R. E. Habermann School/~~Lab~~ Geo. Sci.

Sponsor: National Science Foundation , Washington, D. C.

Type Agreement: Grant No. EAR-8512052

Award Period: From 8/15/85 To 1/31/87* (Performance) 4/30/87 (Reports)

Sponsor Amount:	This Change	Total to Date
Estimated:	$	$ 33,102
Funded:	$	$ 33,102

Cost Sharing Amount: $ _____ Cost Sharing No: G-35-325

Title: Continuation of Quantitative Asperity Recognition of Subduction Zones

ADMINISTRATIVE DATA OCA Contact John B. Schonk x-4820

1) Sponsor Technical Contact:

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Defense Priority Rating: N/A Military Security Classification: N/A

(or) Company/Industrial Proprietary: N/A

RESTRICTIONS

See Attached NSF Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval – Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with GIT

COMMENTS:

No funds may be extended after 1/31/87

* Includes 6 month unfunded flexibility period.

SPONSOR'S I. D. NO. 02,107.000.85.141

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GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

cont
ea. 727 2

Date 7-1-87

Project No. G-35-653 School/~~XXX~~ Geo. Sci.

Includes Subproject No.(s) N/A

Project Director(s) R.E. Habermann GTRC /~~XXX~~

Sponsor National Science Foundation, Washington, D.C.

Title Continuation of Quantitative Asperity Recognition of Subduction Zones

Effective Completion Date: 1/31/87 (Performance) 4/30/87 (Reports)

Grant/Contract Closeout Actions Remaining:

- [ ] None
- [ ] Final Invoice or Final Fiscal Report
- [ ] Closing Documents
- [X] Final Report of Inventions - Questionnaire to P.I.
- [ ] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other

Continues Project No. Continued by Project No.

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Project File
Other Duane H.
Angela DuBose
Russ Embry

FORM OCA 69.285

G-35-653

NATIONAL SCIENCE FOUNDATION
Washington, D.C. 20550

FINAL PROJECT REPORT
NSF FORM 98A

PLEASE READ INSTRUCTIONS ON REVERSE BEFORE COMPLETING

PART I—PROJECT IDENTIFICATION INFORMATION

1. Institution and Address	2. NSF Program	3. NSF Award Number
School of Geophysical Sciences Ga. Institute of Technology Atlanta, GA 30332	Seismology	EAR85-12052
	4. Award Period From 8/15/85 To 4/30/87	5. Cumulative Award Amount $33,102

6. Project Title

Continuation of Quantitative Asperity Recognition in Subduction Zones

PART II—SUMMARY OF COMPLETED PROJECT *(FOR PUBLIC USE)*

This project focused on temporal and spatial variations in seismicity in three different parts of the world: Northern South America, Central Chile, and the South Sandwich Islands. Our major results were:

1) We found strong evidence for substantial temporal instability in teleseismic magnitudes in all of the regions studied. It appears that systematic changes in teleseismic magnitudes of between 0.1 and 0.3 units are fairly common. These changes must be understood and corrected for if seismicity data is to be correctly interpreted.

2) We found that older seafloor has a higher rate of events with mb >= 4.5 to 5.0 than younger seafloor in the same subduction zone. This is the opposite of what one might expect on the basis of the generally accepted idea that older seafloor is more poorly coupled. Support for this idea comes from observations of larger events.

3) Rupture zones of large events tend to coincide with areas that have relatively high seismicity and to abut areas with low seismicity.

4) The mean rate of seismicity in the South Sandwich seismic zone is three times that of the rate in northern South America.

5) Zones of relatively high activity in the South Sandwich subduction zone are related to fracture zones and ridges on the seafloor.

6) Apparent changes in seismicity rate in central Chile which have previously been interpreted as possible precursors may, in fact, be related to systematic changes in magnitude estimates.

PART III—TECHNICAL INFORMATION *(FOR PROGRAM MANAGEMENT USES)*

1. ITEM *(Check appropriate blocks)*	NONE	ATTACHED	PREVIOUSLY FURNISHED	TO BE FURNISHED SEPARATELY TO PROGRAM	
				Check (✓)	Approx. Date
a. Abstracts of Theses		✓			
b. Publication Citations					
c. Data on Scientific Collaborators					
d. Information on Inventions					
e. Technical Description of Project and Results					
f. Other *(specify)*					

2. Principal Investigator/Project Director Name *(Typed)*	3. Principal Investigator/Project Director Signature	4. Date
Dr. Ray E. Habermann	Ray E. Habermann	6/19/87

NSF Form 98A (6-86) Supersedes All Previous Editions

Form Approved OMB No. 3145-0058

Master's Thesis:
Spatial and Temporal Seismicity Variations in the South Sandwich and Northwestern South American Subduction Zones.
Edward Billington, 1986

SUMMARY

The interface seismicity has been examined in two separate subduction zones: the convergence of the Nazca plate and the South American plate between 7°N and 13°S and the South Sandwich Islands subduction zone, where the southernmost oceanic portion of the South American plate is being subducted beneath the South Sandwich plate. Teleseismic data from the Preliminary Determination of Epicenters catalog dating from January 1, 1963 to May 31, 1974 have been examined for temporal and spatial rate changes using various applications of the z-test, a statistical tool which provides the significance of the difference between two means. The purpose of this analysis was to determine what relationships exist between spatial variations in interface seismicity rates, characteristics of the interacting plates, and the rupture zones of great earthquakes. The understanding of these relationships should aid in the prediction of great earthquakes.

Temporal changes that affect each data set in its entirety are believed not to be real changes in seismicity and are refered to as detection-related changes in this study. These are apparently caused by some change in the global network which reports and assigns magnitudes to the teleseismic events. Changes which have been observed and synthesized in both data sets are inconsistencies in assigned magnitudes and changes in the lower threshold of homogeneously-reported data.

Each interface seismic zone has been examined for along-strike variations in the seismicity rate. Anomalously active and quiet inter-

face segments in each region have been found to be spatially related to features on the seafloor of the subducting plate. Segments of the interface corresponding to older seafloor have been found to have a higher rate of moderate events. The rupture zones of past great earthquakes have been found to coincide with areas of moderate or high seismic activity and to be bordered by areas of low activity.

The seismicity rate in the South American interface has been examined for precursory activity before great earthquakes. Evidence has been presented for a significant period of quiescence before the 1979 Colombian great earthquake. In addition, a segment of the South American interface centered at 5.5°S that has no previous record of great earthquakes is currently experiencing at least 6 years of quiescence.